

ALUMINIUM

A MENACE TO HEALTH

LX34(E1,114)

N49

1503

CFTRI-MYSORE



1503

Aluminium: Menac.

by

ARK CLEMENT

1

Flora

203
ALUMINIUM :

A MENACE TO HEALTH

by

MARK CLEMENT

PRESS REVIEWS

The case is presented with force and plausibility, and will no doubt encourage a thorough re-investigation of the entire problem in the days to come.

(Times Literary Supplement—London.)

Altogether it is a most interesting book and one that is well worth reading, especially for anybody interested in health, national or personal.

(Irish Times—Dublin.)

The case against Aluminium is put here with convincing logic. Those who allow its use in their kitchens should buy this book, and it may be the best investment they ever made.

(Books of To-Day—London.)

The author summarises all that has been observed and written about the dangers to health that may arise through the ingestion of minute quantities of Aluminium from cooking vessels, and it adds up to a considerable case.

(Yorkshire Post—Leeds.)

First Published in 1941.

Revised Edition, 1949

(by courtesy of Messrs. Faber & Faber Ltd.)

ALUMINIUM

A Menace to Health

by

MARK CLEMENT

Revised Edition.

True Health Publishing Company
152, Landor Road,
London, S.W.9.

1949



N49

1503

Contents

INTRODUCTION	page 5
1. PRELIMINARY REMARKS	11
2. ALUMINIUM IN FOOD AND ANIMAL TISSUES	14
3. AMOUNTS OF ALUMINIUM DISSOLVED IN COOKING	17
4. MINISTRY OF HEALTH REPORT ON 'ALUMINIUM IN FOOD'	22
5. SCIENTIFIC EXPERIMENTS WITH ALUMINIUM	25
6. ALUMINIUM VESSELS FOUND UNSUITABLE FOR MAKING COFFEE	28
7. MEDICAL REPORTS ON HARMFUL EFFECTS OF ALUMINIUM	30
8. CANADIAN INVESTIGATION	47
9. ALUMINIUM AND CANCER	50
10. SUBSTITUTES FOR ALUMINIUM COOKING UTENSILS	57
APPENDIX	59
REFERENCES	62
INDEX	65

CFTRI-MYSORE



1503

Aluminium: Menac..

Introduction

The second World War brought the question of Aluminium cooking utensils into sudden prominence. Aluminium was urgently needed for Spitfires and Hurricanes, and an appeal was made to the public to surrender their Aluminium pots and pans. Housewives responded nobly to this appeal and thus helped to win the war. But they did more than that ; they removed a potential danger to national health—for let it at once be said that Aluminium is a slow-acting poisonous metal which should not be allowed to be used for making cooking utensils.

The medical evidence against the use of Aluminium in connection with food and drink is of such impressive character that it can no longer be ignored. It constitutes a grave condemnation of a domestic practice which should be given up once for all.

As far back as 1892, German scientists discovered that Aluminium was not a suitable metal for the storage of alcoholic drinks and that poisoning and kidney disease were liable to result from the consumption of "aluminised" beverages. This fact was duly recorded in Abegg's standard text-book of chemistry. (Vol. III, Part I.)

Since then many German doctors have frequently drawn attention to the harmful effects resulting from using Aluminium utensils in the well-known German medical periodical, *Deutsche Aerzte Zeitung*. It would seem that there is a great deal to learn from German investigators on the subject of Aluminium poisoning.

In 1935, The Ministry of Health published a Report entitled *Aluminium in Food* in which the fol-

INTRODUCTION

lowing significant statements were made. "A considerable proportion of the Aluminium taken into the stomach is soluble, the actual amount dissolved varying greatly with circumstances. It is conceivable that extremely small amounts of Aluminium, gaining access to the blood, might immobilize or affect adversely some constituent which operates normally in resisting disease." The above statements are so explicit that they require no further comments.

Recently the London Press reported that an outbreak of Aluminium poisoning had occurred among girls at Perin's Senior School, Alresford, Hants., which had been traced to new Aluminium pans in which the girls had prepared food for themselves in the cookery classroom. The medical officer duly reported to Winchester Rural Council that analysis showed the food contained traces of Aluminium sufficient to cause the symptoms. (See *Daily Express*, 26 Feb., 1948.)

Medical evidence is given in the text showing that infants may be particularly susceptible to Aluminium poisoning. At a convalescent home for babies it was the rule to give every baby a small quantity of soup every day. This was made in an Aluminium saucepan. Diarrhoea, which occurred in consequence, was entirely stopped when the soup was made in an ordinary iron and enamel-lined saucepan.

Further medical evidence on the harmful effects of Aluminium is adduced by Dr. J. E. R. McDonagh, Fellow of the Royal College of Surgeons, and a prominent London medical consultant. Speaking

from a thirty years' experience Dr. McDonagh states that he is "firmly convinced of the harm done by Aluminium cooking utensils. The troubles caused by them are readily diagnosed and improvement in the patient's condition occurs soon after the use of Aluminium utensils has been given up."

The poisonous effects of Aluminium on the human organism have been known to homoeopathic physicians for a long time. The medical profession is greatly indebted to Dr. R. M. Le Hunte Cooper, a Harley Street homoeopath, for being one of the first among doctors to draw attention to the dangers of food contamination by Aluminium. His crusading zeal and authoritative writings have been a beacon of light in a wilderness of ignorance and apathy.

As the average doctor, like the average housewife, appears to be utterly ignorant of the medical evidence against the use of Aluminium cooking utensils, it would seem to be a social duty to enlighten both the profession and the public in that respect.

When Aluminium utensils first came into the market the makers included a slip asking users not to use soda for cleaning them, but no such warning is issued at the present time.

In *Bulletin No. 11* of the British Aluminium Hollow Ware Manufacturers' Association the public is warned that "It is well known that alkalis act as solvents of Aluminium, and therefore salt and soda, and bicarbonate of soda should not be used for cleaning." But unfortunately this warning is not generally known and is not heeded by cooks and housewives who frequently use bicarbonate of soda for cooking. Tests have shown that even with so

INTRODUCTION

weak a solution as 1/100% of bicarbonate the Aluminium was found to be affected.

Some years ago, Dr. Le Hunte Cooper wrote that he heard of a special aluminium pan of the expensive "block" variety manufactured in Sweden, which was reported to be 100% safe. He sent to Sweden for it and arranged for special tests to be carried out which proved that the addition of a little salt dissolved aluminium at once, and Soda in any form dissolved it in quantity. In fact, it was quite unsuitable to be handed over to the public for culinary purposes.

The amount of aluminium dissolved is, of course, largely increased both by prolonged cooking and by the addition of salt, the latter practice being universal.

The object of this monograph is to present a selection of scientific facts based on investigations and experiments conducted by British, American and Continental research workers during the past 25 years. Their unanimous conclusion is that in cooking, Aluminium is slowly dissolved from utensils, thus giving rise to certain compounds that are harmful to health. The general use of Aluminium kitchen utensils is fraught with serious consequences ranging from lesser disorders such as constipation, gastric troubles, skin affections, etc., to major organic diseases varying according to individual susceptibilities.

If the volume of evidence adduced against aluminium in the present monograph fails to convince those using aluminium utensils that such a practice is fraught with serious risks to health,

INTRODUCTION

then this question, instead of being a strictly scientific one, becomes a psychological problem of social importance.

In spite of the logic of facts there are always a large number of people who do not believe what they do not want to believe, especially when reforms affecting conventional habits and customs are suggested.

Many medical investigators in this country and on the Continent have exposed Aluminium as an insidious enemy in our midst but the public have remained ignorant of the dangers lurking in Aluminium cooking utensils. Their bright appearance, lightness, and comparative cheapness have proved irresistible to housewives, but it should be borne in mind that labour-saving devices are not necessarily conducive to the maintenance of health which should always be the first consideration. For centuries the best cooking has been done with iron and earthenware vessels and it behoves us to consider whether this traditional practice was not superior from a health point of view to modern improvements introduced by individuals who specialise in the development of a certain industry but whose knowledge of human nutrition and cooking is nil.

Some time ago an American scientist spent three years in an attempt to discover the best type of vessel for making coffee. The published results of this prolonged investigation, financed by the coffee trade, proved beyond cavil that it was impossible to make good coffee in Aluminium vessels while glass and earthenware ones produced excellent coffee. What applies to coffee holds good for the prepara-

INTRODUCTION

tion of many other foods and beverages.

There are many uses for Aluminium such as construction of aircraft, trains, houses, etc., but when it comes to the preparation of food in Aluminium utensils a halt should be called on grounds of health. Quite apart from its harmful effects on the human organism Aluminium is not a suitable metal for cooking purposes for it cooks food too quickly. Chefs and good cooks have a marked objection to Aluminium utensils for food cooked too quickly does not taste as good as that prepared by old-fashioned methods in tin-lined copper pans and earthenware vessels.

For the guidance of housewives a list of substitutes for Aluminium utensils is given at the end of this booklet.

The word 'aluminium' is derived from the Latin *alumen*, a term applied by the Romans to all substances having an astringent taste.

Aluminium was first used for cooking utensils in 1892. At the time manufacturers were unaware of the dangers to health lurking in aluminium pots and pans. Although aluminium is a cheap metal, in the course of 1930-1, £883,000 worth of it was used in this country for the production of aluminium ware. According to Sir Alfred Chatterton, former member of the Indian Industrial Commission, the importations of aluminium into India, in recent years, have amounted to about 8,000 tons. Writing in *The Times* (9th November 1935), he states that 'Many millions of native utensils have been made of aluminium in India and they are exposed for sale in the bazaars of every town in the country'. But what he omitted to mention was that the manufacture of Aluminium utensils had ruined the native pottery handicraft which had supplied the needs of the Indian people for centuries.

During the past thirty years the manufacture of aluminium ware has given rise to a great commercial organization aided by an intensive publicity campaign. But all the propaganda for aluminium utensils could not suppress the fact that grave doubts had arisen as to the suitability of aluminium for cooking purposes. Even before the first world war the growth of public uneasiness in this connection was such that in 1913 the *Lancet* made an investigation into this matter.

PRELIMINARY REMARKS

The *Lancet* report stated that 'Experiments were made bearing directly on the question whether aluminium is appreciably acted upon by the usual articles of food. If the aluminium of these utensils is acted upon, injury to health ensuing upon the consumption of food so contaminated is assumed.'

But as the extent of such injury and the direction it might take were not investigated, these laboratory experiments did not throw any light on the problem from a medical point of view. A word of warning, however, was given to the effect that '*certain precautions are necessary in order to keep aluminium vessels suitable and hygienic for the purpose (water bottles), the chief of which is that water should not be left in the bottles when not in use. . . . It may be desirable, also, not to scour the vessel to such an extent as to remove any thin coating which forms on the surface, for this coating subsequently becomes protective.*' This clearly implies that contamination of water by aluminium is undesirable and invalidates any argument on the harmlessness of the metal.

Since the *Lancet* report was published in 1913, evidence from all parts of the world has accumulated proving beyond doubt that aluminium, as used for culinary purposes, is injurious to health and may even play a significant part in the causation of certain diseases including cancer.

At the outset it should be realized that quite apart from its toxic effects on the human organism, aluminium is not a suitable metal for cooking utensils.

PRELIMINARY REMARKS

Chefs and good cooks do not like using them, particularly on the Continent where the art of cooking is more highly developed than in this country.

2 Aluminium in Food and Animal Tissues

According to the Ministry of Health Report on 'Aluminium in Food', very few vegetables used for human consumption contain appreciable amounts of aluminium, and the Report adds that 'it would seem that the amount of aluminium naturally present in human and animal tissues is extremely small'. Moreover, sensitive spectroscopic methods of analysis have shown that normal blood usually contains no aluminium, and when it does contain any the proportion is very small. But a considerable quantity of aluminium is found in the blood of the same person after feeding with even one meal of aluminium-containing food (aluminized food). Similar conclusions apply to the milk of nursing mothers.

These sensitive analytical tests were carried out by S. Judd Lewis and recorded in a special paper (see References). The presence of aluminium in the blood and vital organs is considered by many medical men as a cause of various diseases, which are unwittingly self-inflicted. The Ministry of Health Report contains a significant statement in that connection : *'It is conceivable that extremely small amounts of aluminium, gaining access to the blood, might immobilize or affect adversely some constituent which operates normally in resisting disease.'*

Evidence from medical authorities has proved that the daily absorption of particles of aluminium in the human organism not only interferes with the normal

resistance to disease but actually causes a variety of chronic illnesses which are cured on the discontinuance of aluminium cooking utensils.

Chemical Activity of Aluminium

One of the main objections to aluminium for cooking purposes is its much higher degree of reactivity as compared with cast-iron, copper, stainless steel, or earthenware vessels.

Aluminium is readily attacked by organic acids and alkalis, such as are found in fruits and vegetables. It is attacked slowly by cold acetic acid (vinegar), but the rate of attack increases markedly with rising temperature.

Aluminium is readily soluble in alkalis, and in water to which alkalis (soda) have been added. The common practice of adding a pinch of salt or soda to foods cooked in aluminium vessels affects the metal, which contaminates the contents. Even the vested interests concerned have thought it fit to issue a word of warning to that effect. In *Bulletin No. 11* of the British Aluminium Hollow Ware Manufacturers' Association we are told that 'It is well-known that alkalis act as solvents of aluminium and therefore salt and soda and bicarbonate of soda should not be used for cleaning.' But unfortunately this warning is not generally known and is certainly ignored by cooks and housewives. In the latest edition of Mrs. Beeton's famous cookery book the following emphatic warning is given "On no account must soda be used for Aluminium Ware."

The blackening and corrosion of aluminium kitchen utensils is often traced to alkalis that have come in contact with them.

ALUMINIUM IN FOOD AND ANIMAL TISSUES

Hard water, such as tap water in London and many other places, corrodes aluminium and shows signs of cloudiness when boiled in it. This is due to the presence of aluminium hydroxide.

An infusion of tea prepared in an aluminium pot with hard water considerably increases the astringent action of the tea and may cause symptoms of 'indigestion' and other gastric troubles.

Numerous tests have shown that it is impossible to make fine-flavoured coffee in aluminium pots.

A few years ago officers in Kenya suffered from violent gastric attacks as a result of drinking lemon juice kept in aluminium bottles. The native boys refused to have their food cooked in aluminium pots recently supplied, preferring to carry heavier iron ones for miles.

The above facts are recorded in Dr. Le Hunte Cooper's monograph on the subject of aluminium poisoning.

The most important reaction of aluminium, from the point of view of health, is its solubility in hydrochloric acid, which is a normal constituent of stomach secretions. Thus it is clear that aluminium, being soluble in the gastric contents, must be absorbed by the blood and deposited in various organs, where it acts as an irritant and toxic substance, ultimately causing obscure and unrecognized symptoms of aluminium poisoning.

3 Amounts of Aluminium Dissolved in Cooking

The tests conducted by the *Lancet* in 1913 established the fact that aluminium was actually thrown into solution in the process of cooking, but these tests were not quantitative. When Dr. Le Hunte Cooper began his investigations in 1930, both qualitative and quantitative tests were duly carried out, with the collaboration of Dr. Eastes, of the Pathological and Public Health Laboratories in Harley Street.

In view of the statements frequently made by superficial investigators to the effect that the amounts of aluminium absorbed with food contaminated with the metal are negligible, the following facts are exceptionally enlightening. They establish beyond cavil that considerable amounts of aluminium are dissolved in the course of various culinary processes. Hence it follows that the absorption of the metal into the human organism must be in direct ratio to the amount contained in the ingested food or drink, and this, as Dr. Eastes's figures show, is anything but negligible.

The following data are recorded in Dr. Le Hunte Cooper's monograph :

Dr. Eastes' Tests, 1930

1. 1,000 c.c. London tap water was allowed to stand in a saucepan twenty-four hours. The total amount of materials detached or sweated from the pan was 2.45 grains per gallon of water.

The substances were alumina, silica, and iron.

2. On heating milk in an aluminium vessel a considerable amount of material was taken up by the

liquid ; this represented 140 grains per gallon. The greater part of the material dissolved or detached was aluminium.

3. When gooseberries were stewed in the saucepan the metal was readily attacked, as much as 31 to 85 grains per gallon being taken from the material of the pan.

Rhubarb, similarly treated, gave 7.7 grains per gallon.

4. A sample of lemonade was made in the saucepan, using three lemons and 500 c.c. of ordinary water. This liquid attacked the saucepan readily, 25.6 grains per gallon being dissolved, which readily explained the Kenya officers' attacks previously mentioned.

5. A soup of mutton, potatoes, onion, and carrot and 0.5 grammes of salt was made and allowed to stand twenty-four hours.

This test was specially made, as it seems to be a common custom for soup to be left overnight in the pan in which it is cooked. In commenting upon this test Dr. Le Hunte Cooper says the result was absolutely dumbfounding, the action being so intense (though no alkali or acid had been added) that as much as 300 grains of aluminium per gallon was taken from the saucepan.

As a control test, a soup with similar materials was made in an enamel saucepan. No aluminium was found in this case.

The toxic effects of aluminium, like those of any other toxic substance, are insidious and cumulative. In some cases the amount of aluminium ingested with any particular food may be small, but if all the

ALUMINIUM DISSOLVED IN COOKING

sources of entry are taken collectively the dangers to health are correspondingly greater.

At the present time the number of aluminium utensils used in the preparation and storage of food-stuffs and beverages is considerable, as the following list shows :

Saucepans	Colanders and sieves
Preserving pans	Water-bottles
Frying pans	Cooking spoons
Poachers	Egg slices
Grillers	Egg-whisks
Toasters	Teapots
Kettles	Coffee pots
Porridge cookers	Lemon squashers
Cups	Milk containers of various
Tumblers	kinds
Spoons	Salt cellars
Forks	Pepper pots
Mustard pots, etc., etc.	

In addition to the above, aluminium foil is used for wrapping chocolates, cheese, and cigarettes. Steam jacketed pans are made of this metal for institutional kitchens, and even for *foodstuff industries*.

Brewers make wide use of aluminium in the form of vats and fermenting vessels, storage vessels for yeast and beer, and tanks for transport of beer. It appears that the makers of electric refrigerators are replacing the heavy metal drawers for making ice-cubes by others made of aluminium, and that the metal is very largely used in the manufacture of ice-creams so extensively sold in the streets.

The dairy industry also uses aluminium widely as tanks and vessels for the storage, pasteurization,

and transport of milk, and for vats used in cheese-making.

In the light of such facts one might reasonably inquire why most people are not continually ill. According to Dr. Le Hunte Cooper the reason lies in our 'powers of elimination' and 'acquired immunity'. So long as an individual's eliminatory organs function efficiently no obvious symptoms develop, but any cause weakening these powers allows the system to become overcharged and adverse effects follow.

In conclusion, Dr. Le Hunte Cooper remarks that 'not the least result of this state of affairs to be considered is its effect on "diagnosis" and "treatment" of other causes of ill-health, for *until we can eliminate this underlying influence how can we diagnose anything clearly or treat anything satisfactorily?*'

In a monograph entitled "Aluminium and Aluminium Alloys in the Food Industry" (1948), by J. M. Bryan, B.Sc., Ph.D., the following significant admissions are made which should serve as a strong warning to housewives and cooks using Aluminium utensils :—

- (1) Acid products may dissolve Aluminium to a greater or less extent when heated ; alkalies are, of course, definitely harmful.
- (2) Hot fruit juices may attack Aluminium severely.
- (3) Aluminium is not recommended for tomato products that require boiling.
- (4) When creamed cabbage was cooked in Aluminium utensils the amount of Aluminium taken up was 2.4 parts per million.

ALUMINIUM DISSOLVED IN COOKING

With the addition of soda the amount of Aluminium dissolved was 90.5 parts per million, that is to say, nearly forty times as much.

- (5) When rhubarb was cooked in Aluminium utensils for only five minutes the amount of Aluminium dissolved was 41.8 parts per million, with darkening of the pan.
- (6) It has been shown that the action of vinegar on Aluminium may be very severe when salt is present, particularly at boiling temperatures.

4 Ministry of Health Report on 'Aluminium in Food'

In a prefatory note to this Report published in 1935 the Chief Medical Officer of Health states that 'The use of aluminium cooking utensils has been criticized from time to time on the ground that aluminium is a toxic metal and that the small amounts which may be dissolved and find their way into food may cause illness. So persistent have been these criticisms that many people have banished aluminium ware altogether from their kitchens.'

These persistent criticisms must apparently have been based on practical experience, that is to say on evidence obtained in the kitchen and the clinic.

The Ministry of Health, however, did not appoint a team of scientists or a medical committee to investigate the question of aluminium in relation to food and health. No experiments were instigated by the Ministry to elucidate the reason for the persistent criticisms referred to in the Report. Instead of adopting this procedure, the Ministry instructed a Government chemist to investigate the matter. This resulted in a critical survey of all the information available upon the subject, duly set out in an official report.

As the appointed investigator had neither medical nor culinary qualifications for his task his conclusions did not throw a flood of light on the vexed question of aluminium utensils. This official investigation, however, was not altogether futile, for it must have convinced the investigator, and the Ministry of Health also, that an aluminium question did, in fact, exist. For how can one fail to be impressed by nearly

250 references on the literature of the subject given in the Report? It was only too evident that there could be no such verbal monument without considerable material cause. In the circumstances the author of the Report could only give a summing-up of his own impressions of this literature, but no results of biological experiments or of clinical investigations personally conducted.

The conclusions reached, however, indicate that a certain apprehension in regard to aluminium utensils is well founded, as is evidenced by the following comments :

‘On the general question of the possible effect of very small amounts of metallic salts in the blood and tissues of the body, judgment must be suspended until more definite knowledge is obtained. Aluminium salts, in doses which are not high, have been shown to be not without action on digestive processes. It is a safe rule to exclude from food as far as possible anything which may reasonably come under suspicion of causing harm, and on this account it is undesirable to admit aluminium in the relatively large amounts in which it may be employed as a constituent of baking powders or self-raising flour.’ The Report goes on : ‘There is, however, no convincing evidence that aluminium in the amounts in which it is likely to be consumed as a result of using aluminium utensils has a harmful effect upon the ordinary consumer. It is possible that there may be individuals who are susceptible to even such small doses of aluminium as may be derived from aluminium utensils.’

The main object of the present work is to empha-

size that there is 'convincing evidence' showing that aluminium, in the amounts actually consumed as a result of using aluminium utensils, has a definitely harmful effect on the ordinary consumer.

Finally, this Report serves a useful purpose by making a number of significant admissions which by themselves constitute a strong indictment of aluminium as a metal suitable for culinary purposes.

The Report contains the following statements :

1. Alum salts (double salts of aluminium) are gastric irritants.

2. Hard water corrodes aluminium slightly and may become cloudy with aluminium hydroxide.

3. Organic acids act on aluminium to some extent, especially when diluted (such acids are found in fruits and vegetables).

4. Aluminium is readily acted upon by alkalis, and cooking vessels are therefore liable to be damaged if cleaned with soda.

5. Aluminium in the form of hydroxide or phosphate is readily soluble in weak hydrochloric acid, and presumably goes into solution in the gastric juice.

(Hydrochloric acid is a normal constituent of human gastric juice.)

6. A considerable proportion of the aluminium taken into the stomach is soluble, the actual amount dissolved varying greatly with circumstances.

7. It is conceivable that extremely small amounts of aluminium, gaining access to the blood, might immobilize or affect adversely some constituent which operates normally in resisting disease.

The above statements are so explicit that they require no further comments.

Scientific Experiments with Aluminium

An eminent Russian scientist, Professor A. L. Tchi-jevsky, Director of the Central Laboratory for the study of the biological action of ionization, in Moscow, wrote an important paper on the aluminium question which was published in the *Acta Medica Scandinavica*, one of the leading medical periodicals in Europe. The text of Professor Tchi-jevsky's thesis was : 'Aluminium as a factor, contributing to the rise and progress of different pathologic processes in the organism.'

Experiments extending over a period of two years were conducted on human beings and animals. The problem was chiefly studied from an electrochemical point of view.

The results of these investigations were as follows :

1. Some hours (two to ten) after food had been prepared (potatoes, soup, especially with beetroot, milk, etc.), the following external effects were observed. While food prepared in enamel and glass vessels remained unaltered in colour, the food prepared in aluminium vessels showed marked changes in that respect. Potatoes were visibly darker and beetroot definitely blacker, while the layer of milk on the inner side of the aluminium pan was also black. Simultaneously with the modification in the colour, the taste of the food was also altered, and this change became very marked after twelve hours.

2. Analysis of the faeces of men and animals fed from aluminium vessels showed a considerable increase of the albumen products in the gastro-intes-

tinal tract, connected with the phenomenon of inflammation.

3. Attacks of colitis became much more frequent when food was prepared in aluminium vessels. Food prepared in enamel or glass vessels showed a rapid and positive effect on the health of the patients.

There have been cases of complete cure of refractory colitis of several years' duration after exclusive use of enamel or glass vessels.

4. Similar beneficial effects under the same conditions have been observed in people suffering from kidney and liver troubles.

5. As a rule, it has been noticed that a patient who has been completely cured continues to be extremely sensitive (a form of idiosyncrasy) to food prepared in aluminium pans. Thus the whole symptom-complex of colitis may reappear in one to two days after but once taking food prepared in an aluminium vessel.

6. Certain data have established that white mice fed from an aluminium vessel are more apt to develop spontaneous cancer (0.85 per cent) than control animals (0.02 per cent).

Professor Tchijevsky makes the following comments on his own experiments :

It is perfectly evident that one may, for years, use an aluminium pan without feeling subjectively its harmful action. Yet, objective alterations in tissues and organs take place progressively, and finally bring on some serious disease. It is also evident that there exist people who are highly susceptible to the action of aluminium.

Professor Tchijevsky's Conclusions

1. Laboratory work has shown that the salts of

aluminium possess the property of reacting with extreme rapidity with biological fluids, in which they cause permanent modifications.

2. Aluminium salts have the property of rapidly taking away (destroying) the membrane potentials of live cells (negative charge).

Aluminium hydroxide, $\text{Al}(\text{OH})_3$, has a colloidal structure and its particles carry positive charges, hence their neutralizing action on the negative charges.

3. The universal rise of the curves of cancerous diseases during the last twenty-five years attracts attention to the findings of our experiments.

Thus mortality from cancer in 1930 had increased by 40 to 45 per cent in a number of countries, as compared with 1914. The said curves fully coincide with the curves of the production and spread of aluminium ware. There are also indications that since 1900 cancer occurs at a much younger age than formerly.

The problem is apparently of greater importance for medical science than it may seem at first sight.

Aluminium Vessels Found Unsuitable for Making Coffee

A Three-Year Scientific Test¹

A scientific investigation extending over a period of three years, 1932-4, was conducted by Professor Prescott at the Institute of Technology, Cambridge, Mass., U.S.A.² with a view to discovering the best type of vessel for making good coffee. At the time of this investigation aluminium coffee pots and percolators had been widely used for many years in the U.S.A. It appears that over the same period gastric troubles attributed to coffee-drinking grew apace. Without assuming any connection between the two facts, experiments were conducted in a spirit of scientific detachment and the results published at the end of three years' work.

The conclusion reached was that coffee made in glass vessels was harmless and had the best flavour and aroma. Coffee made in earthenware jugs was a good second. But it was found impossible to make fine-flavoured coffee in aluminium vessels. Not only was there often a metallic and bitter taste, but other effects were observed—usually gastric disturbance.

According to Professor Prescott corrosion occurred inside an aluminium pot while making the beverage and the corroded material goes into the next brew.

¹ This three-year scientific test is recorded in E. J. Saxon's pamphlet 'Why Aluminium Pans are Dangerous' (Daniel, London, 1939).

² Cf. *Health and Life*, March 1935.

A THREE-YEAR SCIENTIFIC TEST

This independent investigation, financed by the coffee trade, had no interest whatever for or against aluminium. Its sole object was to find the best way of making coffee. It was definitely established that aluminium vessels produced the worst coffee, and therefore they should never be used by people who appreciate good coffee—and good health.

Confirmation of this investigation is given by a British research worker, N. D. Sylvester, who states that Aluminium has a bad effect on the colour of coffee (and tea), possibly owing to the formation of coloured lakes with the tannins present.

7 Medical Reports on Harmful Effects of Aluminium

Dr. Le Hunte Cooper's Reports

Among the medical pioneers in the investigation of the harmful effects of aluminium Dr. Le Hunte Cooper, late captain, Royal Army Medical Corps, is the best known for his writings on the subject. His monograph entitled *The Danger of Food Contamination by Aluminium* was published in 1932 and is now in its third edition. This was followed by another publication, *Additional Evidence on the Injurious Effects of Aluminium*, a paper read to the National Council for domestic studies in 1936. Dr. Le Hunte Cooper's latest findings are embodied in *An Outline of Aluminium Pathogenesis*, published in 1942. Dr. Le Hunte Cooper is thus one of the foremost medical authorities on the aluminium question. Having suffered himself from aluminium poisoning, he has taken keen personal interest in the problem and his long experience as a medical practitioner renders his evidence exceptionally valuable.

In collaboration with Dr. Eastes he conducted a series of important analytical tests on aluminium which were discussed in an earlier section of the present work. These tests were both qualitative and quantitative, and definitely established the fact that considerable quantities of aluminium were found in foodstuffs cooked in aluminium vessels. And as aluminium is soluble in the gastric secretions normally present in the stomach, the amount of it absorbed into the system is in direct proportion to the amount

present in the food ingested. This has been proved by blood tests on animal and human subjects.

In his first monograph Dr. Le Hunte Cooper describes a series of cases of people suffering from aluminium poisoning without being aware of the cause of their symptoms. On investigation it was found that their food was invariably cooked in aluminium vessels, and on discontinuing their use the patients experienced immediate relief, followed by disappearance of the symptoms they complained of.

According to Dr. Le Hunte Cooper, aluminium, in addition to its irritative, inflammatory, and ulcerative effects upon the gastric and intestinal mucosa, also seriously affects the nervous system. Cases are mentioned illustrating the action of aluminium on the nervous system, of which the most striking are those of long-standing neuralgias, which readily yield to discontinuance of the intake. In certain skin diseases similar dramatic curative results are often observed. He states that the number of medical men who have cured themselves and their patients of longstanding ill-health by simply discontinuing the use of aluminium for cooking purposes is such that their massed testimony entirely outweighs the statements published from time to time to the effect that some observers consider it innocuous because they have given it to animals without any apparent ill-effect. But, as Dr. Le Hunte Cooper pertinently remarks, let us not forget that this is a purely human question and that therefore human evidence must take first rank. The evidence he produces is based

mainly on recovery of health when patients discontinue the use of aluminium vessels, and this evidence is extremely convincing.

Dr. Le Hunte Cooper concludes by saying that clinical evidence goes to prove that aluminium is cumulative in the system and capable of undermining vital processes to a very great extent. It also strongly suggests that the daily elimination of this artificially introduced toxic substance must strain every human organism, even though obvious symptoms are frequently absent. This is borne out by the loss of many minor symptoms, the improvement in general health, the clearing of the skin, etc., found to result from stopping its use by scores of people who showed signs of many varied diseases.

In his opinion the true culpability rests with chemists and laboratory experimenters, who have boldly exonerated aluminium without taking the trouble to investigate the enormous amount of direct evidence of its action on human beings, and without giving credence to the statements of medical men who have themselves made such experiments, with results proving beyond all shadow of doubt its extreme danger to health.

Dr. Leo Spira's Report

One of the most thorough and illuminating studies of the aluminium question is that of Dr. Leo Spira, whose monograph, 'The Clinical Aspect of Chronic Poisoning by Aluminium and Its Alloys', was published in 1933. In this monograph Dr. Spira com-

municates the results of his observations over a period of ten years.

Dr. Spira has investigated the problem of aluminium poisoning both in his own case and in the case of a large number of patients. By systematically examining all the possible causes he has satisfied himself that the real source of the trouble is the use of aluminium utensils in the kitchen. He has actually proved this by the success of treatment based on his findings in cases in which every other method of treatment had failed.

According to Dr. Spira, the symptoms associated with aluminium poisoning may be classified under three main groups, namely :

- (1) Gastro-intestinal ;
- (2) Cutaneous (skin affections) ;
- (3) General.

In the first group the outstanding feature is constipation accompanied by flatulence and colicky pain of such severity as to suggest, in some cases, the possibility of gastric or duodenal ulcer, gall-stones, colitis, or even 'acute abdomen'. Appetite is impaired and attacks of nausea may set in, with vomiting. X-ray examination reveals in these cases only colonic stasis.

Among the skin affections attributable to aluminium poisoning Dr. Spira mentions acute and chronic urticaria, pruritus, herpes, and various forms of eczema.

In the third group in the symptom-complex frequent attacks of neuralgia and twitching of the legs are characteristic. Giddiness and excessive perspiration are often observed. And a low blood-pressure among middle-aged and even older patients is met

with very frequently. Nervous symptoms include depression, loss of energy, and general lassitude.

Dr. Spira is careful to point out that it must not be assumed that all the symptoms are in each case developed to the marked degree which has been described, or that they run concurrently in every patient. In some patients, a few or all symptoms of one group predominate. Others may complain at one and the same time of symptoms described in two of the groups mentioned.

Dr. Spira evolved a treatment for aluminium poisoning which proved curative in every case. The treatment, of course, included the complete elimination of all aluminium utensils and a diet which excluded everything prepared in tap water. The latter often contains aluminium in the form of alum used for purification purposes. This hard, aluminized tap water is in the same category as aluminium vessels and should not be used for cooking or drinking.

This regime, together with large doses of high grade charcoal and aperients, was applied, and it resulted in the most rapid disappearance of all the symptoms, including the skin manifestations.

These conclusive results are confirmed by those of other medical investigators on the Continent and in America. Putensen, in Bavaria, from personal observation of patients, describes the signs and symptoms of aluminium poisoning in practically all details as reported by Dr. Spira. Moreover, he describes the

case of a dog whose persistent rash and sores, accompanied by intense itching, did not respond to local treatment, but disappeared eight days after discarding the aluminium utensils from which the dog was fed.

Von Halla records twenty-five cases of patients suffering from severe constipation and skin affections which did not yield to any treatment on orthodox lines, but were cured after the aluminium utensils had been removed from their households.

In a very comprehensive series of experiments the American physiologists, Underhill and his collaborators, described the metabolism of aluminium. In animal experiments they found that the aluminium content in the blood tended to increase after ingestion of aluminized food. Aluminium was deposited in the various tissues, notably in the liver, kidneys, brain, spleen, and muscles. On examining the tissues of dogs at different ages they ascertained that there existed a direct relationship between the age of the animal and the quantity of aluminium stored in the tissues, and that this tendency for aluminium content to increase with advancing age also existed in man.

In considering the harmful effects of aluminium, Dr. Spira stresses the fact that aluminium contains certain impurities which may play an outstanding rôle in connection with aluminium poisoning. The ordinary incomplete analysis of the aluminium metal is inadequate, for it omits other elements that we may expect to be present in aluminium utensils, since signs and symptoms known to be produced by such elements have disappeared after the utensils have been discarded. As aluminium is attacked by

such a variety of different substances we may expect that, in the process of preparing food, the constituents of the aluminium alloys and also their inevitable impurities should be set free, and so contaminate the food. Such impurities include copper, antimony, fluorine, zinc, lead, tin, etc., which may be found in the utensils. It is obvious that in considering the dangers arising from the use of aluminium for cooking purposes such impurities must be taken into account.

When the aluminium question was discussed in the columns of *The Times* in 1935 Dr. Spira drew attention to the fact that 'thousands of pounds are spent annually, unfortunately with discouraging results, on research into diseases of obscure origin. It is claimed by many medical men that some of these diseases are due to aluminium poisoning, and can, therefore, be prevented.' He continued, 'As a result of prolonged investigation into the causation of digestive disorders prevalent in this country, frequently associated with pyorrhoea, certain skin diseases, eczema, boils, pruritus, etc., it was found that they could be cured in the majority of cases and their recurrence prevented by discontinuing the use of aluminium utensils and eliminating the poison accumulated in the body over the space of years.'

'Moreover, many laboratory experiments conducted by physiologists in France, Germany, Switzerland, and the United States led to the conviction that certain aluminium compounds, on being dissolved in the gastric juice and absorbed into the blood circulation, acted in the same way as lead, copper, mercury, and arsenic.'

Dr. Spira concludes by asserting that the danger arising from the use of aluminium vessels for cooking purposes is thus seen to be a very real one, especially when it is realized that very few people are completely insensitive to the metal.

A great number of contributors wrote to *The Times* giving their own experience and confirming the evidence so convincingly set out in Dr. Spira's masterly study of aluminium poisoning.

Dr. Coram James's Report

[*British Medical Journal*, 9 April 1932.]

Dr. Coram James reports a number of cases with symptoms of gastric disorder. He was successful in most cases in substituting good enamel or iron pots with a complete relief of symptoms—no other treatment being carried out at the same time. He observes : 'It seems like riding coincidence too hard to suppose that a sequence of a score or more relieved could all have been hypersensitive to aluminium. Apparently no cook pays any attention to the "no soda" caution when cooking green vegetables. I still think that the case against aluminium has not been cleared up.'

Dr. Alexander Francis's Report

[*British Medical Journal*, 16 April 1932]

Dr. Francis states that for many years he had suffered from abdominal pain which at times completely incapacitated him. It baffled all attempts at diagnosis. After reading Dr. Le Hunte Cooper's mono-

graph he stopped the use of aluminium vessels and in a short time the pain disappeared. Since then on several occasions he has had a return of pain but each time he found that he had had something cooked in aluminium.

At the time of reporting his own case Dr. Francis had treated six cases in which stopping the use of aluminium vessels had put an end to abdominal pain. In one case a man who had suffered acutely for six months got complete relief as soon as the use of aluminium ceased. Some time later the pain returned, when he found that for some days his porridge had inadvertently been boiled in an aluminium saucepan. On stopping this the pain again disappeared.

Dr. Francis states that a characteristic feature of 'aluminium pain' is that it is not relieved by the ordinary carminatives and sedatives.

Dr. E. H. Rink's Report

[*British Medical Journal*, 6 August 1932.]

Dr. Rink reports two cases of aluminium poisoning. The first case had suffered for eight years from repeated attacks of abdominal pain and had been diagnosed at first as appendicitis. The second case had suffered from 'indigestion' for ten years and had been diagnosed as colitis.

Both patients were treated on the lines suggested by Dr. Spira in his monograph on the subject, that is to say (1) cutting off the source of poison by discarding all aluminium cooking utensils, (2) absorption of toxins by charcoal.

In each case there was a striking improvement within a fortnight, and both patients have been absolutely fit ever since.

Dr. Eric Pritchard's Reports

[*British Medical Journal*, 29 October 1932.]

Dr. Pritchard, an eminent authority on infant care, points out that the susceptibility or immunity of any one individual to the effects of chronic poisoning by aluminium or any other metal is not easily proved by laboratory experiments on animals. He further remarks : 'I have had plenty of evidence of chronic aluminium poisoning among members of my own family and among my personal friends, and also in the case of a dog, and several large groups of infants in institutions under my charge.

'Except in the case of infants, who appear to be very susceptible to the acute effects of aluminium poisoning, symptoms do not usually arise in the case of adults until after prolonged exposure to its effects.'

The following report illustrates the susceptibility of infants to Aluminium.

At a convalescent home with 22 babies the soup was made in an Aluminium saucepan, and it was the rule to give every baby a small quantity every day. Diarrhoea, which occurred in consequence, was entirely stopped when the soup was made in a ordinary iron and enamel-lined saucepan. (*British Homoeopathic Journal*, January 1932.)

Dr. Pritchard also reports that in another instance, a family dog who had some of the soup added to his food every day for some two years developed the

same symptoms and finally died of a condition to which none of the veterinary surgeons could put a name. (Ibid.)

Dr. J. E. R. McDonagh's Report

Dr. McDonagh is one of the most prominent medical research workers in this country and a consultant with an extensive London practice. His independent views have been fully set out in a series of volumes in which he has dealt with the nature of disease with great ability and imaginative insight.

On the question of aluminium Dr. McDonagh observes that he is firmly of the belief that it has played a considerable rôle in raising the incidence of intestinal intoxication in recent years. He further remarks that 'the defenders of aluminium stand on the ground that the amount of aluminium which reaches the system is harmless, but all their evidence goes by the board when the fact is realised that a chemical substance may do more harm in the body by the dissemination of its activity, which cannot be detected, than by its mass.'

Dr. McDonagh gives full credit to Dr. Le Hunte Cooper and Dr. Spira for drawing attention to the evils resulting from the use of aluminium cooking utensils. Dr. McDonagh has experimented with aluminium for many years and his conclusions are recorded in 'Medical Problems of To-day', *Nature of Disease Journal*, vol. iii. He states that apart from the toxic action of the metal, the utensils are not suitable for the best cooking. As a clinician of great experience, Dr. McDonagh is firmly convinced of the harm

done by aluminium cooking utensils. The intoxication caused is readily diagnosed, and improvement in the patient's condition occurs soon after the fault is remedied by turning all aluminium articles out of the kitchen.

In his monumental work, *The Universe Through Medicine*, Dr. McDonagh again stresses the harmful effects of aluminium. He states that there is no element, when used to excess, which more readily dries up the tissues of the body than aluminium. Aluminium leaves nothing but fibrous tissue behind ; it attacks the vascular system in general and the pulmonary vessels in particular. From a culinary point of view, says Dr. McDonagh, the great disadvantage of aluminium utensils is that the food is cooked too quickly and this renders the proteins difficult to digest. He adds that cooks who practise their art by feel instinctively avoid aluminium pots and pans.

Dr. Guyon Richards's Report

['Aluminium Poisoning', *The Chain of Life*, pp. 183, sqq.]

In the course of two and a half years Dr. Richards has come across fifty cases of aluminium absorption. He does not describe them as cases of actual poisoning, but in every case aluminium absorption was an important item. Under treatment every case started to clear out aluminium from the system and improved, and in some cases the improvement was very remarkable.

Dr. Richards remarks that his own experience and that of patients show 'that a dose of aluminium opens

one to effects of so-called "chill", which usually means invasion by various bowel and catarrhal organisms. It is this lowering of resistance which is really the most serious charge against aluminium.' Furthermore, he points out that the worst danger from aluminium does not come from such amounts as a chemist can demonstrate. He states that the element in gross quantities may simply pass through the digestive tract in an individual who does not readily assimilate the metal. Such an individual might escape aluminium poisoning. It would appear that when foodstuffs have become impregnated with the ions of aluminium, a colloid aluminium solution is formed which is in a ready state for absorption.

Dr. Richards concludes his observations with the following statement : 'I have no doubt at all that aluminium is doing a grave amount of harm among the population at large and is probably causing us a serious loss of work energy. There can be no doubt at all that it inflicts grave injury on a number of people.'

American Opinions on Aluminium

The aluminium question has been intensively studied by American investigators for some years. One of the most active workers in that respect is Dr. C. T. Betts of Toledo, Ohio, U.S.A., who has collected a mass of data which he has published under the title, *Aluminium Poisoning*, a book sponsored by the Anti-Cancer Club of America.

Like many investigators of this problem Dr. Betts was himself a victim of aluminium poisoning, and

this doubtless accounts for his fearless exposure of the aluminium 'racket' in America.

It appears that in America aluminium and its compounds are used on a very extensive scale by food manufacturers, chemists, physicians, and public health officials. Investigation disclosed the following principal uses of aluminium.

Aluminium compounds in city drinking water ; in medicines ; in baking powder ; in whisky ; and for cooking utensils.

At one time 3,000 tons of alum were used in connection with the water supply in Toledo, so that the daily drinking of aluminized water was bound to result in cumulative effects.

Tests have been made with water in every city in the United States and every one of them proved that aluminium compounds were dissolved from aluminium cooking utensils. The actual loss in weight from the aluminium ware in these experiments varied according to the nature of the liquid used. Alkaline liquids were considerably more potent in dissolving aluminium than acid liquids. This is yet another proof of the undesirability of using soda in cooking.

Dr. Betts computes that the average person whose food is cooked in aluminium ware and whose bread is baked with alum baking powder consumes four to five grains of aluminium salts at each meal or twelve to fifteen grains a day, and this every day of the year.

The absorption of aluminized foods and drinks must necessarily exert the usual action of aluminium salts on the tissues and organs of the body. According to Chittenden and Underhill, two prominent American investigators, aluminium, regardless of absorp-

tion, can exert an irritating action on the mucosa of the gastro-intestinal tract and have a deleterious effect on the food by changing its nutritional quality.

Dr. Harry G. Wells, pathologist of the University of Chicago, has made an extensive study of the effects of aluminium compounds upon various forms of life, including the higher animals. He not only states that the blood, nervous tissues, kidneys, and other organs are poisoned or destroyed by aluminium compounds when they gain access to the body by absorption from ingested foods, but that the reproductive organs are affected first, even before any symptoms are manifested.

Dr. Wells writes : 'In my opinion, the effects of aluminium compounds, the passing into the human system by absorption, would make themselves felt in the reproductive organs. The cells of these organs are particularly sensitive to the action of any poisonous substance and often show marked changes when changes in other parts of the body are undiscoverable even by *careful microscopic studies*.

'My opinion is that aluminium compounds are poisonous to all forms of life, including the higher animals.'

This pronouncement from an American authority suggests that if certain glands are affected by aluminium, other glands in the body must also be attacked, with the result that the functions of the glandular system as a whole may be more or less seriously impaired. From the point of view of general health this is a factor of the utmost importance which should be given serious attention.

Dr. Betts repeatedly refers to the scourge of cancer

and its great increase during the past twenty-five years, which coincides with the universal use of aluminium cooking utensils. This subject will be further discussed in the chapter on 'Aluminium and Cancer'.

As a result of his personal experience Dr. Betts decided to organize a crusade for better national health, the chief object of which was to condemn the use of aluminium cooking utensils and aluminium in all its forms mixed up with foods, drinks, and medicines. He has, of course, been counter-attacked by vested interests concerned, but he has received strong moral and practical support from a vast number of medical men and scientists as well as from the general public from all parts of the States.

Dr. Betts has succeeded in rousing great interest in this matter and has convinced many of his countrymen that serious results may occur from absorbing aluminium compounds, whether in the form of aluminized foods or medicines containing aluminium salts.

In his work on 'Trace Elements in Food' (1949), Dr. G. W. Monier Williams states that two American investigators, Flinn and Inouye (*J. American Med. Assoc.* 90, 1010—1928) have suggested that metals considered to be non-toxic may possibly combine with constituents of the blood cells or serum and affect some of their functions, such as those of resistance to disease, although no apparent action can be detected. This, as Dr. Monier Williams remarks, would seem to constitute

MEDICAL REPORTS ON HARMFUL EFFECTS

an argument for keeping extraneous metals out of food as far as possible, and not placing too much reliance on negative evidence as to their effects on health.

As Dr. McDonagh has pointed out, a chemical substance such as Aluminium, may do more harm in the body by the dissemination of its activity, which cannot be detected, than by its mass.

A most thorough investigation of the Aluminium question was made recently in Canada by W. E. Holder, M.E., Fellow of the International Faculty of Science, and the result was recorded in two books, the first of which entitled "Why Humanity Suffers" appeared in 1943, and the second "Cancer in Humanity" in 1946.

Mr. Holder made a systematic search of the medical literature on the subject and his list of references, numbering over 100 and including British, French and German contributions, constitutes a formidable indictment of Aluminium as a poisonous metal to the human organism.

Starting as far back as 1893 Mr. Holder quotes a report from the Public Health Department, Bern, Switzerland, in which two Swiss doctors state: 'Aluminium will, in general, be attacked by alkaline fluids, as well as salt, at a comparatively low degree of heat. At boiling heat the destruction is much different, and in some cases, becomes quite extensive. Damage to health from the consumption of foods or drinks from Aluminium utensils is to be expected.'

This is followed by numerous reports which appeared in the well-known German medical periodical *Deutsche Aerzte Zeitung*, Berlin, all condemning the use of Aluminium utensils and pointing out their harmful effects. Writing in this journal, on 14 December 1930, Dr. G. Turan cautions above all against using Aluminium utensils in the handling of dairy products, such as milk and sour milk in the making of cottage cheese, etc. He also warns against

the effects of aluminum cans for canning food. He writes that the French have proved that in beef, canned in Aluminium cans, amounts of Aluminium from 1 to 145 milligrams in 100 grams could be found. He considers that the amount of Aluminium consumed daily in food that has been prepared in Aluminium utensils is 100 milligrams.

It would seem that there is a great deal to learn from German investigators on the subject of Aluminium poisoning.

On the subject of Aluminium compounds Mr. Holder quotes a leading American authority, Dr. Harry G. Wells, pathologist of the University of Chicago.

‘Aluminium compounds are classified as protoplasmic poisons. The fundamental element of all cells is protoplasm which in its essential characteristics and behaviour is similar in all living forms. I base this opinion upon knowledge of the literature, reports of investigators, observations of experiments upon evidence in the literature concerning the effects of Aluminium compounds upon men, and upon my own observations without exception, as far as I have been able to find, *these investigators have all observed that the effect of these compounds upon the living cells was deleterious even when the Aluminium compounds were present in remarkably small quantities.*’

‘*A small quantity of Aluminium acting for a long time may produce results quite as marked as a larger quantity acting for a shorter space of time.*’

‘There are two effects to be observed at the introduction into the human digestive tract of Aluminium compounds, the direct effect of carrying

the substance into the circulation, and an indirect effect in the intestine and in the arterial tract, rendering the human organism more susceptible to disease'.

There are many other reports quoted in Mr. Holder's books in support of his own conclusions that Aluminium is an insidious poison which does far more harm than is generally realised and may lay the foundations of a wide variety of diseases.

The mortality from cancer in this country has now reached the staggering figure of over 70,000 victims per annum, and continues to increase year after year. This alarming increase has occurred in spite of 'improvements' in medicine, greater numbers of doctors and hospitals, boosted methods of treatment such as radium and X-rays, large public donations for research, and enormous State contributions for public health.

The problem of the causation of cancer is many-sided, so that no hypothesis can be rejected as altogether untenable, for although it does not present the whole truth it may reveal a significant aspect of it.

Over 50 per cent of the total deaths from cancer in this country are due to lesions in the gastro-intestinal tract, i.e. stomach and associated structures. It is also well known to the medical profession that cancer is invariably associated with chronic irritation brought about by the presence of a great variety of cancer-producing substances, such as tar, shale-oil, soot, arsenic, etc., not to mention those acting as internal irritants, such as aniline, and it is firmly believed by many qualified investigators that aluminium can certainly be included in this group.

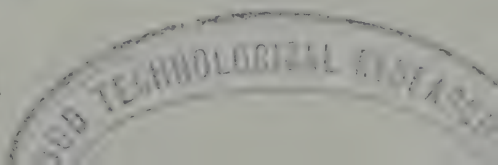
At a medical congress at Arnheim (Holland) in 1934 Dr. Le Hunte Cooper read a paper in which he made the definite statement, after giving his reasons for it, that 'aluminium poisoning is the greatest predisposing cause of malignant disease at the present time.' Not one of the medical men from France, Germany, Switzerland, Scandinavia, America, and

other countries protested or disagreed with this statement. On the contrary they brought forward examples from their own experience of cases of deranged health due to the use of aluminium.

In his remarkably interesting work, *The Chain of Life*, Dr. Guyon Richards states that he has often been asked the question : Does aluminium cause cancer? One of his patients pointed out that cancer had markedly increased during the period aluminium had come into common use and that bowel disease had also increased during that period. Dr. Richards observes that he has no conclusive evidence that aluminium causes cancer, adding that it has sufficient crimes without that! He admits, however, that aluminium may produce a type of bowel irritation which prepares the gut for cancer. He mentions three cases in which aluminium was apparently the cause of a return of cancer toxæmia

The investigations of Dr. Tchijevsky on the rôle of aluminium in the causation of disease have already been mentioned, but in connection with cancer they assume an even greater importance.

Dr. Tchijevsky's experiments have shown that mice fed from an aluminium vessel are about forty times more prone to develop spontaneous cancer than control animals. He also drew attention to the fact that there has been a universal increase in the incidence of cancer during the last twenty-five years and that this increase coincides with the universal use of aluminium utensils. And he concluded by pointing out that the aluminium question, from a medical point of view, is of greater importance than it may seem at first sight.



ALUMINIUM AND CANCER

In Switzerland, Odier reported that a few persons, hitherto in perfect health, had developed cancer of the digestive tract some months after the introduction of aluminium utensils into their households. He suggested the possibility of a connection between the alarming increasing incidence of cancer and the widespread use of aluminium for cooking purposes.

From observations described by two independent observers, Buerstenbinder and Merk, the hypothesis of Odier appears to be gaining ground as one of the causes of cancer in the digestive tract.

In America the subject of aluminium in relation to cancer has received more attention than in this country. Dr. C. T. Betts, of Toledo, Ohio, discusses the matter at some length in his work on *Aluminium Poisoning*, significantly sponsored by the Anti-Cancer Club of America. Several authorities condemning the use of aluminium are quoted, notably Dr. C. L. Olds of Philadelphia, who expressed his views in *Cancer*, published in New York, as follows: 'Cooking utensils made of aluminium are exposed for sale in our shops. A few months ago we thought that quite a discovery had been made when it was found that *all foods cooked in aluminium receptacles greatly increased the cancer reactions* and even water boiled in an aluminium dish behaved similarly. All baking powder containing alum compounds had the same effect; they were inimical to the cancer patient. . . . Can we expect our treatment to be highly effective while these causes are active? I think not. The conclusion is obvious.'

Dr. Betts remarks that all the research work and millions of dollars spent in the hope of discovering

the cause and cure of cancer have produced no definite result. Aluminium, being absorbed in the human organism, acts as an irritant to all living tissues, and chronic irritation is invariably associated with the development of cancer. Therefore Dr. Betts maintains that aluminium, when ingested with foods cooked in aluminium utensils, may be said to be as specific a cause as any other protoplasmic poison. This aluminium question is an aspect of the cancer problem which has been entirely ignored by laboratory investigators, who might be reminded of a famous aphorism of Hippocrates, 'In searching for the obscure, do not overlook the obvious'.

One of the most exhaustive studies on aluminium in relation to cancer has been made by H. W. Keens, a research worker, whose investigations were first recorded in a monograph entitled *Cancer and Its Prevention* (1934), which was followed by another work with the significant title, *Death in the Pot*, published in 1937 and sponsored by two eminent medical men, who contributed a preface to it.

According to Mr. Keens, the presence of an excess of free aluminium in the soil, resulting from artificial fertilization, is the primary cause of malignancy.

Mr. Keens points out that a wrongly balanced condition of mineral elements results in an unhealthy soil, and a similar condition operates in the human body. Anything which interferes with a normal balance prevents the operation of the natural laws of selectivity, which are uncontrollable by mankind.

All foods consumed are products of the soil, so that a deficiency of any element in the soil causes a de-

iciency in plant life and animal life.

It has been established that when herbage is grown in soil deficient in the various mineral elements, the soil is too rich in aluminium, and this element toughens the fibre of the plant, thus causing abnormal growth.

It is gradually being recognized that cancer is not merely a medical question but a problem for the experimental biologist.

The disease of plants known as crown gall is the nearest equivalent to cancer in the human body, and the fact that both plant cancer and human cancer have been successfully treated to the point of radical cure by the same therapeutic methods is a discovery of the utmost importance.¹

Mr. Keens was one of the first research workers in this country who drew attention to the extensive part played by aluminium under modern conditions. Aluminium is used for almost every conceivable purpose nowadays. Apart from kitchen utensils of all descriptions, aluminium is found in face creams, in foil for wrapping chocolates, tea, tobacco, etc., and in dental plates. Aluminium is also extensively used by leading food industries in the form of vats, containers, and vessels of all kinds.

According to Mr. Keens, when food is prepared for human consumption in aluminium ware the oxide from the vessel unites the aluminium precipitate with the available chlorine in the water, and with foodstuffs so boiled, resulting in aluminium chloride.

¹ For full details of experiments and illustrations, before and after treatment, readers are referred to *The Secret of Life*, by Georges Lakhovsky, translated by Mark Clement (Heinemann, 1939).

The high proportion of this provides the chemical complex that reduces the nutritive properties of the foodstuffs.

It appears that an excess of free aluminium robs the body of free potash, sulphur, and silica, and brings these elements into suspension. In this way the glandular system in particular, and most probably the pituitary gland, is deprived of its controlling influence, which results in uncontrolled growth, i.e. tumours.

Thus, in consequence of the action of aluminium on mineral salts, potash, sulphur, chlorine, silica, there is a deficiency in the animal body of those essential salts, causing a derangement of physical and chemical processes by which normal functions are maintained.

Having formulated the theory that any condition of the soil causing a lack of balance of mineral salts and resulting in a higher percentage of aluminium salts gives rise to fungoid or unnatural growths in plants and animals, Mr. Keens proceeded to elaborate his views in a more advanced work entitled *Death in the Pot*, already referred to, in which he deals with certain biological and biochemical aspects of the causes of cancer.

In considering the rôle played by aluminium in the causation of cancer Mr. Keens points out that aluminium is not a natural constituent of animal tissue. It is only in recent times that aluminium has been found in increasing amounts in the tissues and organs of animals and human beings. He remarks that when vegetables and fruits are cooked in aluminium vessels with the usual amount of soda or

ALUMINIUM AND CANCER

table salt, the oxide of aluminium is dissolved and aluminium hydroxide is evolved. This latter substance has a natural affinity for organic matter and readily combines with chemical elements or compounds which are the normal constituents of foods. Moreover, aluminium hydroxide is readily acted upon by the hydrochloric acid normally present in the stomach. The result is an astringent and embalming fluid which coagulates proteins and degrades enzymes. It irritates and favours ulceration of the mucous surfaces. Its interactions with sulphur and ammonia constituents of organic matter result in alum (a double salt of aluminium), and provides a substance which, even in infinitesimal amount, is injurious to normal tissues. This may be one of the causes of the pre-malignant state.

It should be added that Mr. Keens's investigations on the aluminium question have been carried out in a scientific spirit and that his monographs are thoroughly well documented. The conclusions of this independent research worker deserve the most careful consideration from the general public and the medical profession.

10 Substitutes for Aluminium Cooking Utensils

The choice of safe substitutes for aluminium pots and pans is a wide one. The change-over may involve a certain amount of expense, but the improved flavour of unaluminized food and the improvement in health, not to mention the prevention of chronic disease, are compensations which amply justify scrapping all aluminium kitchen utensils.

The following utensils will be found perfectly satisfactory from a hygienic point of view :

1. Enamel pans of good quality (Judge's is a reliable brand). Enamel pans of inferior quality are not recommended.

2. Earthenware vessels are excellent and the best cooking can hardly be achieved without them. There are many brands in the market both British and French, the latter are said to be superior. "Adamantine" crockery, made in Stoke-on-Trent, is supplied to the Homoeopathic Hospital where no Aluminium cooking utensils are used.

3. Pyrex, and similar fireproof glass, is a perfect material for cooking purposes. It has distinct advantages. It cooks food evenly all through, and preserves its natural goodness.

4. The best type of metal saucepan is undoubtedly the stainless steel saucepan. It is the cleanest and the most durable utensil for all culinary purposes. Its price is fairly high, but in the long run it is the most economical utensil of all and constitutes a sound investment.

SUBSTITUTES FOR ALUMINIUM UTENSILS

5. For cooking by electricity, cast-iron pans with their bases ground flat have been used for many years with satisfactory results. The pans are now made with their interiors tinned and with their exteriors coated with vitreous enamel for easy cleaning.

6. For those who cannot afford to buy any of these, enamelled iron stewpans are the best for general use. Their extra cost as compared with ordinary enamelled pans is well worth while, as the enamel is less likely to chip off and less likely to burn.

Appendix

Throughout this monograph stress has been laid on the harmful effects resulting from aluminium utensils as commonly used in domestic practice.

It seems desirable to add that though aluminium utensils constitute the main source from which aluminium compounds reach the human organism, there are two other sources from which aluminium may be absorbed to a more or less considerable degree, namely, baking powder containing alum, and medicines containing aluminium salts.

Alum in Baking Powder

In the Ministry of Health Report on 'Aluminium in Food' the following recommendations are made about the exclusion of aluminium as an undesirable substance in certain articles of diet.

'As ordinarily used, baking powders prepared with sodium aluminium sulphate may introduce into bread about 0.05 per cent of aluminium or 500 parts per million. This is much more than the amount taken up by food from aluminium cooking vessels, even allowing for the fact that bread usually forms only a small part of a mixed diet, whereas a large proportion of the daily food may have been cooked in aluminium vessels' (p. 14).

And again : 'It is a safe rule to exclude from food as far as possible anything which may reasonably come under suspicion of causing harm and on this account it is undesirable to admit aluminium in the relatively large amounts in which it may be employed as a constituent of baking powders or self-raising flour' (p. 22).

Alum is widely used in America in the making of bread, cakes, pastries, etc. In England it is generally looked upon as an adulterant, but according to the Ministry of Health Report 'there are indications that attempts are being made to revive the sale of alum baking powders in this country' (p. 4).

Under present conditions of food inspection the public have no guarantee whatever that all brands of baking powder and self-raising flour on the market are free from alum. In the circumstances the public would be well advised to request the local authorities to undertake a periodic analysis of samples of various brands of baking powder and self-raising flour in order to avoid the possibility of absorbing considerable amounts of aluminium in certain articles of their ordinary daily diet.

The health of the nation cannot be left to the mercy of unscrupulous vested interests. Any offence against regulations on the adulteration of foodstuffs should be dealt with with the utmost severity, for, in this connection, any sign of leniency tends to encourage food tricksters and perpetuates the evil.

Aluminium in Medicines

Aluminium is prescribed in medicines chiefly in the form of alum, which is a double sulphate of aluminium and potash or aluminium and ammonium. It is a powerful astringent and may be administered as a mouth wash or a gargle in cases of tonsillitis and pharyngitis.

The toxic properties of alum are illustrated by the following case cited in a standard text-book of medical jurisprudence. 'A diphtheritic child, aged 3, died from the effects of a teaspoon of alum given in

syrup as an emetic. The child did not vomit and died shortly after.'¹

The latest development in aluminium medication is in the form of colloidal aluminium hydroxide in doses varying from 60 to 180 grains for the treatment of gastric ulcer. In the course of a month's treatment the patient may take as much as 20 to 30 ounces of colloidal aluminium into his system. The immediate results of such massive dosage are claimed to be good, but judgment must be suspended until patients heavily dosed with aluminium have made a permanent recovery without showing signs of some newly acquired disease due to the cumulative effects of the metal.

Students of the history of medicine have often remarked that new cults in medical practice spring up with a frequency reminiscent of the endless vagaries of feminine fashions. Both manifestations appear to be of an experimental nature which more often than not defy all rational analysis.

In the light of the clinical evidence of aluminium poisoning presented in this monograph it would seem most undesirable to prescribe aluminium in any form as a therapeutic agent for internal use. Such treatment may be fraught with serious dangers to aluminized patients who may subsequently suffer from a variety of ailments unwittingly inflicted by a medication whose soundness is, to say the least, extremely questionable, and whose ultimate place may soon be found in the ever-expanding museum of medical antiquities.

¹ Taylor's *Principles and Practice of Medical Jurisprudence* (9th edition, London, 1934), vol. ii, p. 419.

References

- Abegg—*Handbuch der Anorganischen Chemie*, 1906, vol. iii, Part I, p. 68.
- Acta Medica Scandinavica*—cf. Prof. A. L. Tchijevsk
- Betts, Charles T., *Aluminium Poisoning* (Toledo Ohio U.S.A., 1928. Sponsored by the Anti-Cancer Club of America).
- Dare We Use Aluminium Cooking Utensils?* (Toledo Ohio, 1932).
- British Homoeopathic Journal*, January 1932; May 1942.
- Bryan, J. M., 'Aluminium and Aluminium Alloy in the Food Industry', Department of Scientific and Industrial Research. Food Investigation Special Report No. 50, London : His Majesty's Stationery Office, 1948.
- Buerstenbinder, 'Über Aluminium-Kochsalz-Verbindungen', *Deutsche Aertze Zeitung*, 227.
- Cooper, R. M. Le Hunte, *The Danger of Food Contamination by Aluminium* (London, 1932, 3rd edn.)
- Additional Evidence on the Injurious Effects of aluminium* (London, 1936).
- An Outline of Aluminium Pathogenesis* (London 1942).
- Holder, W. E., *Why Humanity Suffers* (Redcloth Publishing Company, Toronto, Canada, 1943, pp. 114-115 and pp. 185-190.

REFERENCES

- Cancer in Humanity* (Redcloth Publishing Company, Windsor, Ontario, Canada, 1946) pp. 113-120 and pp. 126-128.
- Keens, H. W., *Cancer—Its Prevention* (London, 1934).
Death in the Pot (London, 1937).
- Lancet*, 4 January 1913, pp. 54-5, 'Some Kitchen Experiments with Aluminium'.
- Lewis, S. Judd, 'The Assimilation of Aluminium by the Human System', *Biochemical Journal*, vol xxv (1931).
- McDonagh, J. E. R., 'Medical Problems of To-day', *Nature of Disease Journal*, vol. iii (London, 1934).
Aluminium Poisoning (London, 1936), 'The Common Cold and Influenza', pp. 125, 126.
The Universe through Medicine pp. 132, 133 (London, 1940).
The Nature of Disease up to date pp. 56, 57 (London, 1946).
- Medical Reports on Aluminium poisoning :
1. Dr. Coram James, *British Medical Journal*, 9 April 1932.
 2. Dr. Alexander Francis, *ibid.*, 16 April 1932.
 3. Dr. E. H. Rink, *ibid.*, 6 August 1932.
 4. Dr. Eric Pritchard, *ibid.*, 29 October 1932.
 5. Dr. Guyon Richards, *The Chain of Life*, pp. 183 sqq. (London, 1934).
- Merck, F. H., 'Akute Aluminiumvergiftungen', *Deutsche Aerzte Zeitung*, 245.
- Ministry of Health Report, 'Aluminium in Food', by G. W. Monier-Williams, F.I.C. (London, 1935).

REFERENCES

- Odier, R., 'Le Cancer de l'Aluminium', *Les Neoplasmes*, 1925, vol. 4, p. 145.
- Putensen, O., 'Zum Aluminium Problem', *Deutsche Aerzte Zeitung*, 223, 231, 242.
- Richards, Guyon, 'Aluminium Poisoning', *The Character of Life*, pp. 183 sqq. (London, 1934).
- Saxon, Edgar J., *Why Aluminium Pans are Dangerous* (London, 1939).
- Spira, Leo, *The Clinical Aspect of Chronic Poisoning by Aluminium and Its Alloys* (London, 1933).
 'Aluminium Cooking Vessels', *The Times*, 2 November 1935.
- Sylvester, N. D. (*Chem. and Ind.* 54, 279-1935).
- Tchijevsky, A. L., 'Aluminium as a factor contributing to the rise and progress of different pathological processes in the organism', *Acta Medica Scandinavica*, vol. 83 (1934).
- Turan, G., 'Aluminiumgeschirre und Hygiene', *Deutsche Aerzte Zeitung*, 221.
- Underhill, F. P., 'Absorption and Excretion of Aluminium in Normal Man', *American Journal of Physiology*, 1929, vol. 90, 40.
- Von Halla, F., 'Aluminium und Darm', *Deutsche Aerzte Zeitung*, pp. 195 and 201.
- Williams, G. W. Monier, cf. Ministry of Health Report, 'Aluminium in Food'.
 'Trace Elements in Food' (Chapman & Hall, London, 1949).

Index

INDEX OF NAMES

- Abegg, 5
Betts, C. T., 42-45, 52
Buerstenbinder, 52
Chatterton, Alfred, Sir, 11
Chittenden, 43
Clement, Mark, 54
Cooper, Le Hunte, R., 7, 8, 16, 17
20, 30-32, 50
Eastes, 17
Francis, Alexander, 37-38
Halla, von, 35
James, Coram 37
Keens, H. W. 53-56
Lakhovsky, George, 54
Lewis Judd S., 14
McDonagh, J. E. R., 40-41, 46
Merck, 52
Odier, 52
Olds, C. L., 52
Prescott, Prof., 28
Pritchard, Eric, 39
Putensen, 34
Richards, Guyon, 41-42
Saxon, Edgar J., 28
Spira, Leo, 32-36
Tchijevsky, A. L., 25-27, 51
Underhill, 35, 43
Wells, G. Harry, 44, 48
Williams, G. W. Monier, cf.
Ministry of Health Report
on 'Aluminium in Food' 22

SUBJECT INDEX

- alkalis, as cause of blackening
and corrosion of aluminium
utensils, 15
solubility of aluminium in, 15
alum, and water supply, 43
in baking powders, 23, 59
toxic properties, 59-60
alum salts, as gastric irritants, 24
aluminium & Aluminium Alloys
in the Food Industry, 20-21
aluminium, amounts dissolved
in cooking, 17-21
analytical tests (Dr. Eastes's),
17-18
animal experiments in Ameri-
ca, 44
animal experiments in Russia,
25-27
as constituent in baking pow-
ders and self-raising flour, 23
as factor contributing to rise
and progress of different
pathologic processes, 25
assimilation by human system, 14
chemical activity of, 15
defenders of, invalid evidence, 40
harmful effects of, 30-46
importation—into India, 11
impurities contained in, 35
rôle of impurities in cases of
poisoning, 35
medication, 60-61
scientific experiments, 25-27
solubility in alkalis, 7, 8, 15
solubility in fruit and vege-
table juices, 20-21
solubility in stomach, 24
spectroscopic tests, 14
stored in various organs, 35
Aluminium in animal tissues,

INDEX

- in food—see Ministry of Health Report, 14, 22-24
- in human blood, 14
- in medicines, 60-61
- in soil, 53
- Aluminium compounds, effects on various forms of life, 44
- effects on reproductive organs, 44
- poisoning, cumulative effects of, 18
- poisoning, in animals, 35
- poisoning in babies, 39
- in Senior Girls School, 6
- in human beings, symptoms of, 33
- treatment of, 34
- utensils, appeal for, 5
- list of, 19
- results of discarding them, 33, 36, 41
- substitutes for, 57-58
- unsuitability of, for cooking, 10
- Aluminium, and cancer, 50-56
- and glandular system, 44
- and hard water, 16
- American opinions on aluminium, 42-45
- Baking powders, prepared with alum, 59
- Bicarbonate of soda, as solvent of Aluminium, 7, 8, 15
- Blackening of aluminium utensils due to alkalis, 15
- Canadian Investigation, 47-49
- Cancer, development of, in digestive tract following use of aluminium utensils, 52
- development of, in mice fed in aluminium vessels, 26
- increased reactions caused by foods cooked in aluminium utensils, 52
- in plants and human beings, successful treatment of, 54
- problem of causation, 50
- rôle played by aluminium, 50
- Cancer, and aluminium, 50-56
- Coffee, made in aluminium sels, a three-year scientific test, 28-29
- Cooking, unsuitability of aluminium utensils for, 10
- Disease, extremely small amount of aluminium in relation to, 24
- Enamel pans, as substitutes for aluminium utensils, 57
- Earthenware vessels, as substitutes for aluminium utensils, 57
- Fireproof glass, as substitute for aluminium utensils, 57
- Food, cooked in aluminium utensils, altered taste of, 24
- cooked in aluminium utensils, effects on, 25
- German opinions on Aluminium, 5, 47-48
- Hydrochloric acid, solubility of aluminium in, 24
- Importation of aluminium into India, 11
- Indian Industrial Commission, 11
- Iron pans, as substitutes for aluminium utensils, 58
- Lancet*, Report on 'Some Kitchen experiments with aluminium', 11-12
- Lemon juice, in aluminium bottles, effects of, 18
- Medical reports on harmful effects of aluminium, 30-46
- Dr. Le Hunte Cooper's Report, 30-32
- Dr. Leo Spira's Report, 32-33
- Dr. Coram James's Report, 33-34
- Dr. Alexander Francis's Report, 37-38
- Dr. E. H. Rink's Report, 38
- Dr. Eric Pritchard's Report, 38

INDEX

- Dr. J. E. R. McDonagh's Report, 40-41
Dr. Guyon Richards's Report, 41-42
Medicines, aluminium in, 60-61
Mice, fed on aluminized food, experiments, 26
Ministry of Health Report on 'Aluminium in Food', 5
Pyrex glass, as substitute for aluminium utensils, 57
Soda and effect on Aluminium, 7, 8, 15, 21
Oil, aluminium in, 53
Stainless steel, as substitute for aluminium utensils, 57
Substitutes for aluminium utensils, 57-58
Swiss opinions on Aluminium, 47, 52
Symptoms of aluminium poisoning, 33
Tea, prepared in aluminium pots, effects of, 16
Vinegar, effect on Aluminium, 15, 21
Water, aluminized, unsuitable for drinking and cooking, 12
hard, and corrosion of aluminium utensils, 16
supply, and alum, 43

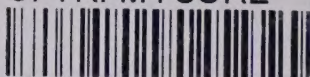


C. E. T. R. I. LIBRARY MYSORE.

V.C.N-1,
18/8/89



CFTRI-MYSORE



1503

Aluminium: Menac...

